CHAPTER 5: FACTORS AFFECTING ICT LITERACY

5.1 Introduction

Factors affecting ICT literacy was assessed with the use of univariate and bivariate statistics before proceeding with multivariate analysis. Based on the responses to a number of questions, a score was devised to measure ICT literacy. The score was computed by summing up the responses to the following 6 key areas: word processing, spreadsheet, database, statistical package, e-mail and the World Wide Web. Word processing is considered one of the earliest and practical skills a student usually acquires. Spreadsheet use is less widespread but having such skills is considered an extra asset. Database and statistical skills are considered important in this age of evidence-based medicine and medical students are expected to acquire some skills in using these packages before leaving medical school. E-mail skills are usually acquired along with exposure to the World Wide Web but skills in making use of the World Wide Web are considered very important today, particularly with the recent emphasis of problem-based learning in the medical faculty.

The skills are self-reported and rated on a scale from 0 (no skill at all) to 5 (highest skill). These are then added up to form a total skills score. Because this is considered as a scale variable, the mean is used to summarise the score. Thus the mean total score is used as a dependent variable. This variable is expected to differ by year of study, place of residence, gender, ethnic group, availability of student funding and exposure to ICT prior to entering university. It is hypothesised that younger students would be more ICT-savvy compared to the more senior ones, with the increasing availability of personal computers. Place of residence would also be expected to make a difference as students residing at home are students who reside in the Klang Valley and thus may

be more likely to be exposed to ICT than others. It is uncertain how student funding may be expected to influence ICT literacy but it may have an impact on the amount of money that the student may have at their disposal. Certainly ICT exposure prior to entering university may have some influence on the ICT literacy.

5.2 Measures of ICT Literacy

There is no standard method to measure ICT literacy. In this study, ICT literacy is assessed through three different measures which will be used as dependent variables in the following analyses. Specific applications like the Internet, word processing and spreadsheets are also measured in addition to the composite scores.

The first measure is a self-reported ICT literacy score. This score was constructed from the sum of the self-reported rating of ICT skills in word-processing, spreadsheet use, database, statistics, e-mail and Internet use. The second measure is the self-rating of their overall knowledge in computers. The third measure is the use of an ICT identifier score. Students were tested on their knowledge on several computer terms. A correct response was scored as 1 and an incorrect response was scored as 0. Based on answers to 9 questions, the highest possible total score is 9 and the lowest possible score is 0.

Levene's test was used to test for homogeneity of variances between the groups. A significant Levene's test ($p<0.05$) indicates significant differences in variances between the groups. In the following analyses, none of the groups have significant differences, and so the results of the t-test and ANOVA could be used without much problem. The value of skewness was used to test for normality assumptions before

carrying out tests on the self-reported skills score [Table 5.1]. None of the values of skewness were outside the range of ± 2 and so the assumption of normality was made.

Table 5.1: Skewness values of quantitative variables

Independent variable	Self-reported rating of ICT skills	Self-rating of overall knowledge	ICT identifier score
Gender			
Male	-0.242	-0.052	0.686
Female	-0.571	0.171	1.429
On scholarship			
Yes	-0.512	-0.130	1.227
No	-0.188	0.447	0.946
Used PC before university			
Yes	-0.351	0.153	1.097
No	-0.691	-0.115	1.895
Place of residence			
College	-0.319	0.025	1.167
Renting	-0.464	1.146	0.801
Family	-1.874	0.261	0.928
Year of study			
1	-0.554	-0.542	1.213
2	-0.535	0.590	0.892
3	-0.668	-0.365	1.309
4	-0.190	0.342	1.041
5	0.338	0.599	0.996
Race			
Malay	-0.492	-0.025	1.386
Chinese	-0.352	0.169	0.927
Indian	0.085	0.333	0.746
Others	-0.562	0.383	0.969

5.3 Self-reported ICT literacy

Analysis was done on the self-reported ICT literacy score according to several factors [Table 5.2]. Analysis of Variance shows that significant group differences in the ICT score exist in terms of gender and ethnicity. However, there are no significant differences in the mean score in terms of place of residence, scholarship versus non-scholarship holders and computer knowledge prior to entering the university.

Table 5.2 shows that the mean ICT score is significantly higher among male respondents as compared to their female counterparts ($p<0.001$). Among the different ethnic groups, the mean ICT score is highest among the "Others" and lowest among the Chinese. Scheffe's multiple comparison tests show that the ICT score among Chinese students is significantly lower than that of the Malays and 'Others' ($p<0.05$). Significant differences also exist between the various years of study. Year 1 and Year 3 students had higher mean scores compared to their seniors.

Table 5.2: Analysis of self-reported ICT literacy score by selected variables

Variable	Mean ICT score	Levene's test p-value	p value (t-test or ANOVA)	Scheffe's test p-value (where sig)
Gender		0.207	0.001	Not applicable
Male	17.38			
Female	16.00			
Race		0.497	0.01	Malay-Chinese (0.05)
Malay	17.03			
Chinese	15.46			Chinese-Others (0.037)
Indian	17.31			
Others	17.98			
Residence		0.072	0.468	Not applicable
College	16.63			
Renting	15.94			
Family	17.14			
Scholarship		0.083	0.692	Not applicable
Yes	16.65			
No	16.48			
Used PC before university		0.093	0.190	Not applicable
Yes	16.64			
No	15.40			
Year of study		0.021	0.001	1 & 4 (0.01)
1	17.82			3 & 4 (0.039)
2.	16.75			
3	17.22			
4	15.40			
5	15.80			

5.4 Correlation between self-reported ICT Score and Selected Variables

The correlation between ICT score and other relevant variables that are measured in interval or ratio scales can be assessed through the Pearson correlation coefficient. Table 5.3 shows the existence of significant correlation between ICT score and several variables. Self-reported ICT score is positively correlated with parents' income, self-reported rating of knowledge (by far the strongest association), and ICT identifier score. A negative correlation exists between ICT identifier score and the

number of years of study. The more senior the student, the lower is the ICT score (r=-0.139, $p<0.001$).

Table 5.3: Correlation between self-reported ICT score and some variables

Variable	Pearson's r	p-value
Parents' income	0.165	<0.001
Self-reported rating of knowledge	0.577	<0.001
Year of study	-0.139	<0.001
ICT identifier score	0.283	<0.001

5.5 Use of Internet

There appears to be some discrepancy in the proportion of students claiming to use the Internet and those who use the computer. Fourteen percent (14%) of all students reported that they have not used the computer at all but only 11% reported that they have not used the Internet. It is difficult to explain this discrepancy but a misunderstanding in the meaning of "not using the computer" may be the cause. It is possible that these students may consider using the computer as other activities apart from accessing the Internet.

Significant differences can be observed with the usage of the Internet in terms of gender. Table 5.4 shows that male students are more likely than female students to use the Internet. As expected, those who used computers before entering the university are much more likely to use the Internet as compared to those who did not have prior experience. There is no significant difference in Internet usage among students from the various ethnic groups. Likewise, no significant difference was observed between those who stayed in residential college and those who stayed elsewhere.

5.6 Use of software

There are significant differences between ethnic groups, sexes and year of study in the use of word-processing software [Table 5.5]. Malays are more likely to use word-processing software compared to Chinese (OR 0.48; 95% CI 0.31, 0.75) and Indians (OR 0.47; 95% CI 0.23, 0.98) but males are less likely to use word-processing software compared to females (OR 0.42; 95% CI 0.28, 0.64). Year 2, 3 and 4 students are more likely to use word-processing software compared to Year 1 students. However, as for spreadsheets, there are no differences between the various ethnic groups, sexes and years of study [Table 5.6]. Significant differences exist between ethnic groups and years of study in the use of presentation software [Table 5.7]. Chinese students are less likely than Malay students to use presentation software (OR 0.55; 95% CI 0.31, 0.95) and Year 4 and 5 students are less likely to use them compared to Year 1 students.

Table 5.4: **Factors affecting usage of the Internet**

Variable	Use the Internet (%)	Pearson's χ^2 p-value[10]	Odds ratio (95% CI)
Ethnic group		0.096	
Malay	290/330 (87.9)		1.00
Chinese	187/205 (91.2)		1.43 (0.77, 2.69)
Indian	43/52 (82.7)		0.66 (0.28, 1.57)
Others	37/38 (97.4)		5.10 (NS)*
Total	557/625 (89.1)		
Gender		0.009	
Male	253/272 (93.0)		2.15 (1.23, 3.74)
Female	304/353 (86.1)		
Total	557/625 (89.1)		
Place of residence		0.074	
College	465/528 (88.1)		1.00
Renting	58/61 (95.1)		2.62 (0.76, 10.8)
Home	34/35 (97.1)		4.61 (NS)*
Total	557/624 (89.3)		
Used PC before university		<0.001	
Yes	537/592 (90.7)		8.46 (3.83, 18.70)
No	15/28 (53.6)		
Total	552/620 (89.0)		

* Not significant. CI not shown because of small sample size giving rise to large standard errors

[10] with continuity correction unless not applicable

Table 5.5: Factors affecting usage of word-processing software

Variable	Use word-processing (%)	Pearson's χ^2 p-value[11]	Odds ratio (95% CI)
Ethnic group		0.004	
Malay	295/346 (85.3)		1
Chinese	156/212 (73.6)		0.48 (0.31, 0.75)
Indian	38/52 (73.1)		0.47 (0.23, 0.98)
Others	33/40 (82.5)		0.82 (0.32, 2.14)
Total	522/650 (80.3)		
Gender		<0.001	
Male	203/280 (72.5)		0.42 (0.28, 0.64)
Female	319/370 (86.2)		
Total	522/650 (80.3)		
Year of study		<0.001	
Year 1	64/98 (65.3)		1
Year 2	124/143 (86.7)		3.47 (1.75, 6.90)
Year 3	143/167 (85.6)		3.17 (1.67, 6.03)
Year 4	112/141 (79.4)		2.05 (1.10, 3.83)
Year 5	79/101 (78.2)		1.91 (0.97, 3.76)
Total	522/650 (80.3)		

Table 5.6: Factors affecting usage of spreadsheet software

Variable	Use spreadsheet (%)	Pearson's χ^2 p-value[12]	Odds ratio (95% CI)
Ethnic group		0.131	
Malay	60/346 (17.3)		1
Chinese	22/213 (10.3)		0.55 (0.31, 0.95)
Indian	6/52 (11.5)		0.62 (0.23, 1.61)
Others	6/40 (15.0)		0.84 (0.30, 2.22)
Total	94/651 (14.3)		
Gender		0.111	
Male	33/281 (11.7)		0.67 (0.42, 1.09)
Female	61/370 (16.5)		
Total	94/651 (14.3)		
Year of study		0.579	
Year 1	15/98 (15.3)		1
Year 2	26/144 (18.1)		1.22 (0.58, 2.59)
Year 3	24/167 (14.4)		0.93 (0.44, 1.98)
Year 4	16/141 (11.3)		0.71 (0.31, 1.61)
Year 5	13/101 (12.9)		0.82 (0.34, 1.95)
Total	94/651 (14.3)		

[11] with continuity correction unless not applicable. Chi-square for linear trend where applicable

[12] with continuity correction unless not applicable. Chi-square for linear trend where applicable

Table 5.7: **Factors affecting usage of presentation software**

Variable	Use presentation (%)	Pearson's χ^2 p-value[13]	Odds ratio (95% CI)
Ethnic group		0.003	
Malay	119/346 (34.4)		1
Chinese	46/213 (21.6)		0.53 (0.35, 0.79)
Indian	19/52 (36.5)		1.10 (0.57, 2.09)
Others	17/40 (42.5)		1.41 (0.69, 2.87)
Total	201/651 (30.9)		
Gender		0.079	
Male	76/281 (27.0)		0.73 (0.51, 1.04)
Female	125/370 (33.8)		
Total	201/651 (30.9)		
Year of study		<0.001	
Year 1	39/98 (39.8)		1
Year 2	64/144 (44.4)		1.21 (0.70, 2.11)
Year 3	58/167 (34.7)		0.80 (0.47, 1.39)
Year 4	22/141 (15.6)		0.28 (0.15, 0.54)
Year 5	18/101 (17.8)		0.33 (0.16, 0.66)
Total	201/651 (30.9)		

5.7 Level of comfort with computer software and hardware

Table 5.8 shows that place of residence and having used a computer before entering university do not appear to be related to being comfortable with computer software. Male students are more likely than female students to be comfortable with software and there appears to be some difference between the various races in this respect. Indian students appear to be most comfortable with software compared to other races.

Table 5.9 shows that ethnicity, place of residence and having used a computer before entering university do not appear to be related to being comfortable with computer hardware. Again, as with software, male students are more likely than female students to be comfortable with computer hardware and those staying at home are also more

[13] with continuity correction unless not applicable. Chi-square for linear trend where applicable

likely than those staying in college to be comfortable with hardware compared to those staying in college. Being comfortable with software or hardware does not appear to make students feel that ICT facilitate their studies or research but it does seem to facilitate presentations.

5.8 Perceived use of ICT in studies, research and presentation

Table 5.10 presents factors affecting the perception that ICT facilitates their studies. Ethnicity, gender and place of residence do not provide significant differentials on the perceived use of ICT for various purposes, but students who had used computers before entering university are more likely to perceive that ICT facilitates their studies.

Table 5.11 looks at the factors affecting the perception that ICT facilitates research. As with their studies, ethnicity, place of residence and gender do not seem to affect this perception. However, students who had used ICT before entering university are more likely to perceive that ICT helps facilitate research.

Table 5.12 summarises factors that affect the perceived us of ICT in presentations. Here it would seem that place of residence and usage of ICT before university are related to the perception that ICT facilitates presentations.

Table 5.8: Factors related to level of comfort with computer software

Variable	Comfortable with software/total (%)	Pearson's χ^2 p-value[14]	Odds ratio (95% CI)
Ethnic group		0.029	
Malay	111/335 (33.1)		1.00
Chinese	86/212 (40.6)		1.38 (0.95, 2.00)
Indian	27/51 (52.9)		2.27 (1.20, 4.29)
Others	13/39 (33.3)		1.02 (0.47, 2.14)
Total	237/637 (37.2)		
Gender		<0.001	
Male	130/278 (46.8)		2.07 (1.49, 2.87)
Female	107/359 (29.8)		
Total	237/637 (37.2)		
Place of residence		0.343	
College	195/537 (36.3)		1.00
Renting	24/63 (38.1)		1.08 (0.61, 1.91)
Home	17/35 (48.6)		1.66 (0.79, 3.46)
Total	236/635 (37.2)		
Used PC before university		0.51	
Yes	227/602 (37.7)		
No	9/30 (30.0)		1.41 (0.64, 3.14)
Total	236/632 (37.3)		
ICT facilitate in studies		0.223	
Yes	199/516 (38.6)		1.35 (0.87, 2.09)
No	35/110 (31.8)		
Total	234/626 (37.4)		
ICT facilitate in research		0.861	
Yes	212/559 (37.9)		1.09 (0.64, 1.87)
No	23/64 (35.9)		
Total	235/623 (37.7)		
ICT facilitate in presentations		0.043	
Yes	211539 (39.1)		1.73 (1.04, 2.88)
No	23/85 (27.1)		
Total	234/624 (37.5)		

[14] with continuity correction unless not applicable

Table 5.9: Factors related to level of comfort with computer hardware

Variable	Comfortable with hardware/total (%)	Pearson's χ^2 p-value[15]	Odds ratio (95% CI)
Ethnic group		0.444	
Malay	69/331 (20.8)		1.00
Chinese	51/212 (24.1)		1.20 (0.78, 1.85)
Indian	15/51 (29.4)		1.58 (0.78, 3.19)
Others	7/39 (17.9)		0.83 (0.32, 2.08)
Total	142/633 (22.4)		
Gender		<0.001	
Male	83/278 (29.9)		2.14 (1.46, 3.12)
Female	59/355 (16.6)		
Total	142/633 (22.4)		
Place of residence		0.057	
College	116/535 (21.7)		1.00
Renting	13/63 (20.6)		0.94 (0.47, 1.86)
Home	13/33 (39.4)		2.35 (1.07, 5.13)
Total	142/631 (22.5)		
Used PC before university		0.316	
Yes	137 (22.9)		1.93 (0.66, 5.63)
No	4 (13.3)		
Total	141/598 (23.6)		
Perceived use of ICT in studies		0.329	
Yes	119/513 (23.2)		1.34 (0.79, 2.28)
No	20/109 (18.3)		
Total	139/622 (22.3)		
Perceived use of ICT in research		1.00	
Yes	126/555 (22.7)		1.05 (0.56, 1.96)
No	14/64 (21.9)		
Total	140/619 (22.6)		
Perceived use of ICT in presentation		0.198	
Yes	127/536 (23.7)		1.55 (0.85, 2.85)
No	14/84 (16.7)		
Total	141/620 (22.7)		

[15] with continuity correction unless not applicable

Table 5.10: Factors affecting use of ICT in studies

Variable	Facilitates studies/total (%)	Pearson's χ^2 p-value[16]	Odds ratio (95% CI)
Ethnic group		0.403	
Malay	283/337 (84.0)		1.00
Chinese	171/208 (82.2)		0.88 (0.54, 1.43)
Indian	38/51 (74.5)		0.56 (0.27, 1.18)
Others	31/40 (80.0)		0.76 (0.32, 1.91)
Total	524/636 (82.4)		
Gender		0.237	
Male	236/279 (84.6)		1.32 (0.87, 2.00)
Female	288/357 (80.7)		
Total	524/636 (82.4)		
Place of residence		0.121	
College	437/537 (81.4)		1.00
Renting	53/62 (85.5)		1.35 (0.62, 3.04)
Home	33/35 (94.3)		3.78 (NS)*
Total	523/634 (82.5)		
Used PC before university		0.001	
Yes	503/603 (83.4)		3.77 (1.73, 8.22)
No	16/28 (57.1)		
Total	519/631 (82.3)		

* Not significant. CI not shown because of small sample size giving rise to large standard errors

[16] with continuity correction unless not applicable

Table 5.11: Factors affecting use of ICT in research

Variable	Facilitates research/total (%)	Pearson's χ^2 p-value[17]	Odds ratio (95% CI)
Ethnic group		0.334	
Malay	308/337 (91.4)		1.00
Chinese	180/205 (87.8)		0.68 (0.37, 1.24)
Indian	43/51 (84.3)		0.51 (0.20, 1.29)
Others	36/40 (90.0)		0.85 (0.26, 3.02)
Total	567/633 (89.6)		
Gender		0.671	
Male	246/277 (88.8)		0.87 (0.52, 1.44)
Female	321/356 (90.2)		
Total	567/633 (89.6)		
Place of residence		0.059	
College	474/535 (88.6)		1.00
Renting	57/61 (93.4)		1.83 (0.61, 6.17)
Home	35/35 (100.0)		Not applicable
Total	566/631 (89.7)		
Used PC before university		<0.001	
Yes	545/600 (90.8)		6.41 (2.86, 14.38)
No	17/28 (60.7)		
Total	562/628 (89.5)		

[17] with continuity correction unless not applicable

Table 5.12: Factors affecting use of ICT in presentations

Variable	Facilitates presentations/total (%)	Pearson's χ^2 p-value[18]	Odds ratio (95% CI)
Ethnic group		0.791	
Malay	292/336 (86.9)		1.00
Chinese	182/208 (87.5)		1.05 (0.61, 1.83)
Indian	42/50 (84.0)		0.79 (0.33, 1.96)
Others	33/40 (82.5)		0.71 (0.28, 1.88)
Total	549/634 (86.6)		
Gender		0.724	
Male	241/276 (87.3)		1.12 (0.70, 1.78)
Female	308/358 (86.0)		
Total	549/634 (86.6)		
Place of residence		0.036	
College	457/535 (85.4)		Inaccurate estimates
Renting	58/62 (93.5)		
Home	34/35 (97.1)		
Total	549/632 (86.9)		
Used PC before university		<0.001	
Yes	526/600 (87.7)		4.34 (1.97, 9.56)
No	18/29 (62.1)		
Total	544/629 (86.5)		

5.9 Multiple linear regression on ICT identifier score

Stepwise multiple linear regression was performed with the ICT identifier score as the dependent variable. The following independent variables were tested:

- Year of study
- Parents' monthly income
- Number of siblings
- Self-reported skills score

[18] with continuity correction unless not applicable

- Self-reported rating of computer knowledge
- Number of months on the Internet
- Ethnicity
- Gender

P-P plots were used to examine the following variables for normality: year of study, parents monthly income, number of siblings, total skills score, number of months using the Internet and ICT identifier score (see Appendix). The plots show that each of the distributions does not deviate too much from normal distribution, thus the normality assumption is not severely violated. Given the large sample size, the central limit theorem can also be applied, as in the case of parents' monthly income. There does not appear to be any multi-collinearity in the final model as all tolerance values are close to 1 and the variance-inflation factor values are low [Table 5.13].

Table 5.13: Tests for multi-collinearity in the model

Variables	Tolerance	Variance inflation factor
Self-reported rating of computer knowledge	0.973	1.028
Number of siblings	0.960	1.042
Parents' monthly income	0.962	1.039
Gender	0.963	1.038

Table 5.14: Multiple regression on ICT identifier score

Variables included	ß	Standardised ß	t	p-value
Constant	-0.454		-1.068	0.286
Self-reported rating of computer knowledge	0.924	0.292	6.841	<0.001
Number of siblings	-0.143	-0.132	-3.069	0.002
Parents' monthly income	0.0001064	0.131	3.052	0.002
Gender	1.175	0.264	6.163	<0.001
Adjusted $r^2 = 0.218$				

In the final model, only 4 independent variables emerged as significant [Table 5.14]. Even the constant was not significant, suggesting that model passed through the origin. All the variables have positive coefficients except for number of siblings. Thus it would seem that the higher the self-reported rating of computer knowledge and the higher the parents' income, the higher would be the ICT identifier score. However, the larger the family size, the lower the score. The adjusted r^2 is relatively small at 0.218, suggesting the difficulty in predicting human behaviour. The inclusion of more relevant variables into the model may improve the predictive power.